Joint INCOSE Working Group Webinar Series

13 June 2018: Transportation Working Group

Applying Scrum Methods in Intelligent Transportation Systems (ITS) Projects

Jesse Glazer
FHWA

Barbara Staples
Noblis

Blake Christie
Retired

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International Council on Systems Engineering

Joint INCOSE Working Group Webinar Series

Webinar Plan:

- Regular webinars at fixed, predictable days & time
- Organized by the following INCOSE Working Groups (alphabetical order):
  - Automotive Working Group (AWG)
  - Critical Infrastructure Protection and Recovery (CIPR)
  - Infrastructure Working Group (IWG)
  - **Transportation Working Group (TWG)**
- Round robin approach
- Monthly basis, usually second Wednesday @ 11AM ET / 8AM PT
- One hour duration: ca. 45 min presentation, 10-15 min Q/A
- Webinars recorded and uploaded to INCOSE CONNECT & INCOSE TWG YouTube

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Next Webinar (July 18 2018): A System of Systems Approach to Automotive Challenges

Content:

- *Discusses automotive challenges the industry is currently facing*
- *Provides an introduction into System of Systems Engineering (SoSE)*
- *Provides examples and case studies of successful SoSE*
- *Makes recommendations on how to address the automotive challenges applying SoSE*

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INCOSE Transportation Working Group (TWG) YouTube Channel

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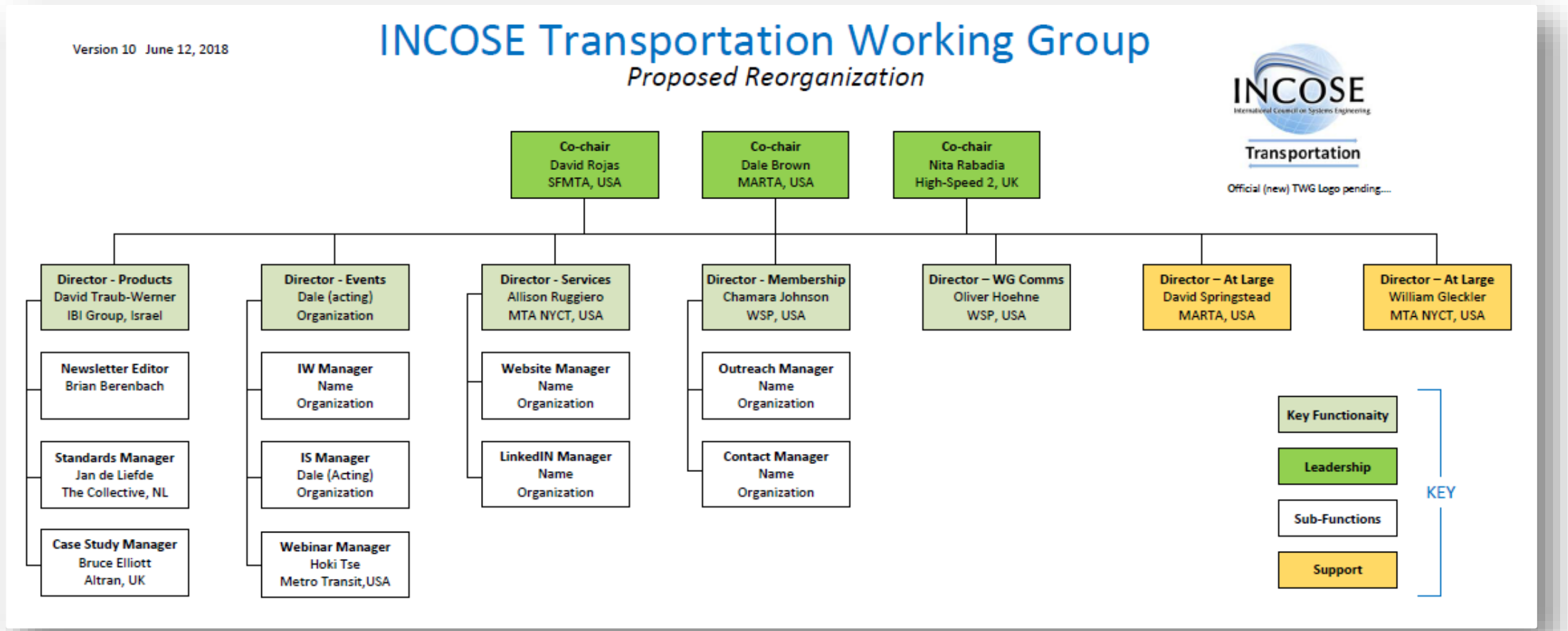
INCOSE Transportation Working Group (TWG) Organizational Chart



https://www.incose.org/incose-member-resources/working-groups/Application/transportation

INCOSE
International Council on Systems Engineering

2018 International Symposium

28th Annual INCOSE international symposium

Washington, DC, USA
July 7 - 12, 2018

Delivering Systems in the Age of Globalization

Engage with your colleagues from the Systems Engineering community!

Learn about state-of-the-art methods and essential skills for Systems Engineers.

Find out how people are making a difference with Systems Engineering.

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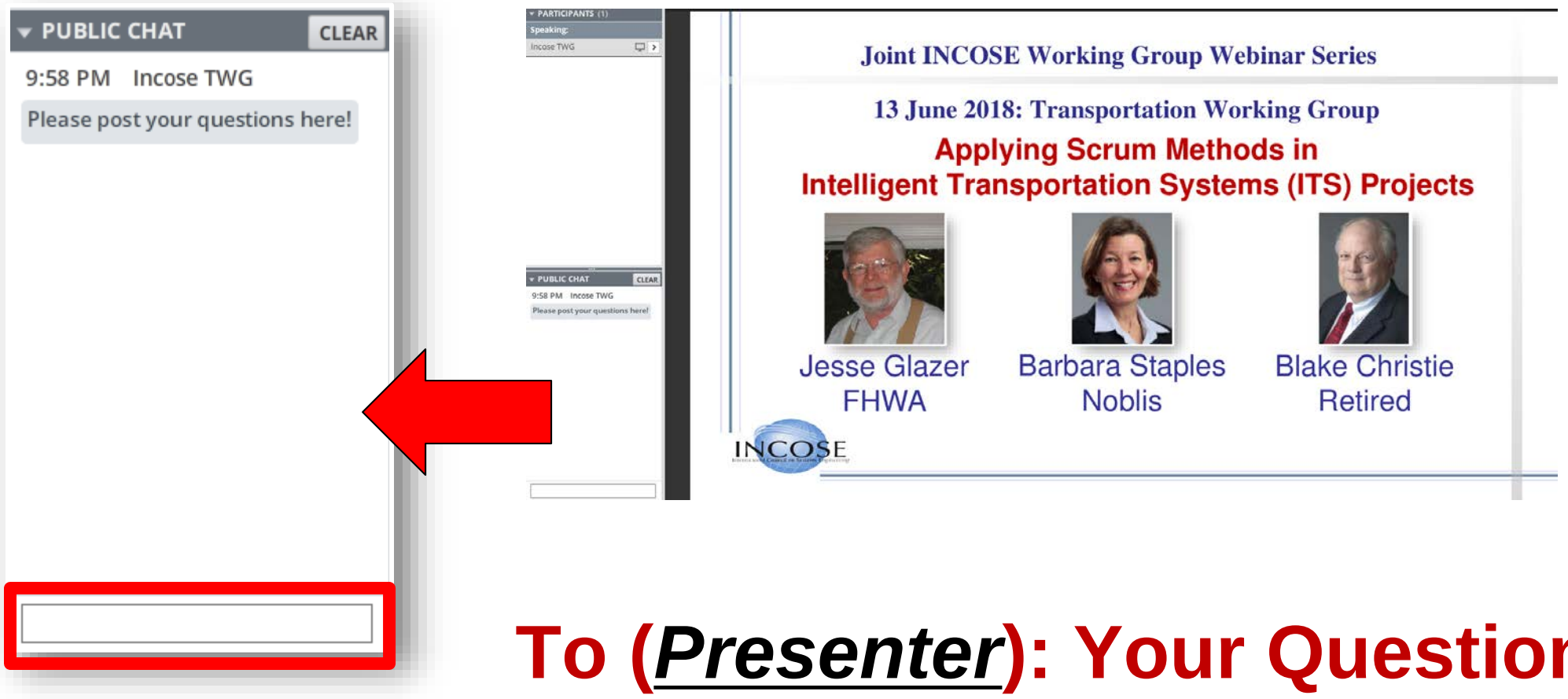
Please post your questions under the “Public Chat” box



To (*Presenter*): Your Question

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Using Agile/Scrum Methods for Intelligent Transportation Systems

Prepared for:

INCOSE TWG Webinar

June 13, 2018

Presented by:

Jesse Glazer

ITS Engineer

USDOT

Barbara Staples

Principal

Noblis

Presentation Topics:

Jesse:

- **What is “ITS”?**
- **How has ITS evolved? What’s in the future?**
- **What is the role of Systems Engineering?**

Barbara:

- **Why did USDOT develop the report?**
- **Why is it important to deployers?**
- **What’s in the new USDOT Report?**

What is "ITS"?...

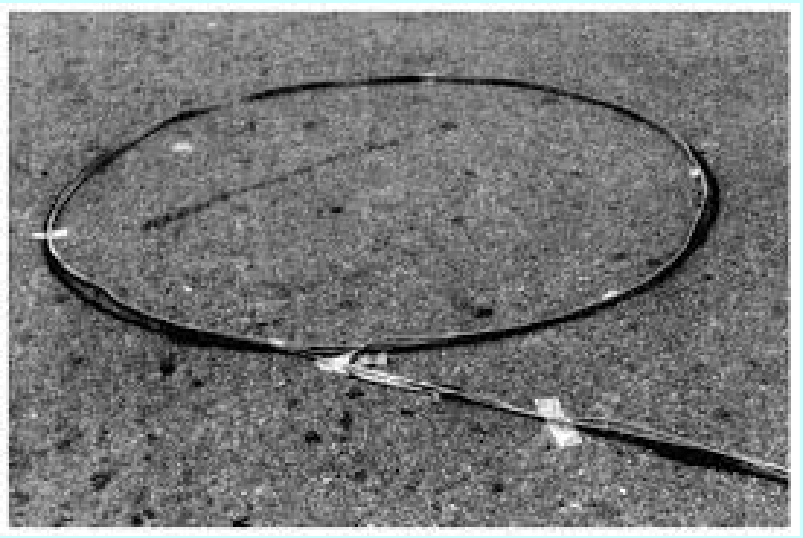
- **Short Answer = "Technology in Transportation"**
- **USDOT Definition =**
  "ITS means electronics, communication, or information processing used … to improve efficiency or safety of a surface transportation system." (23CFR940.3)

  (Excludes boats, planes & most rail.)
- **Federal regs apply to federally-funded projects**
- **ITS is heavily dependent upon "IT" resources**

Evolution of ITS
(1968 → Now)

"*Transportation Technology*" is >100 years old!

1970's – Freeway Traffic Management



Traffic Detection "loops"

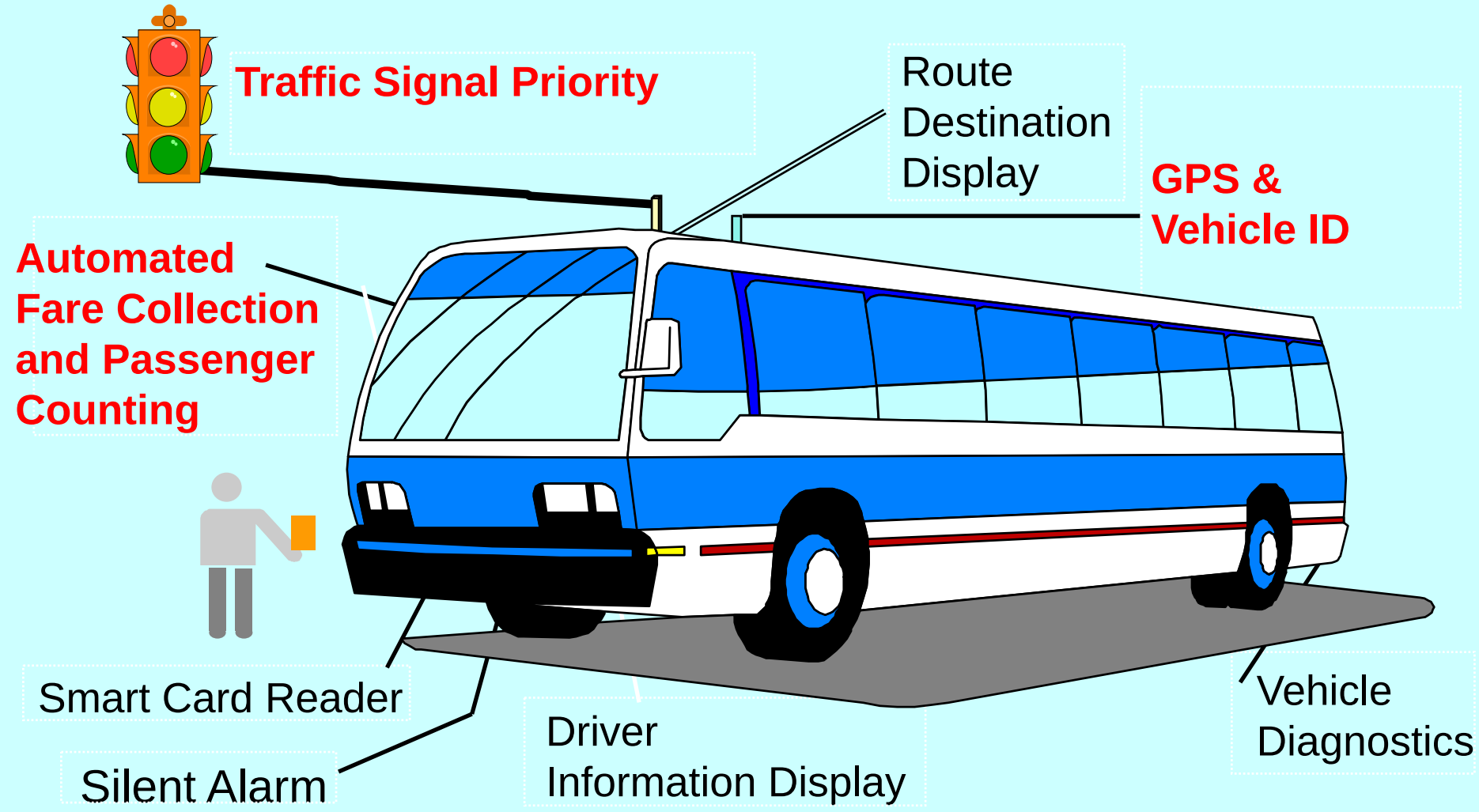
Electronic Message Signs

Ramp Meters

1980's – *Arterial* Traffic Management

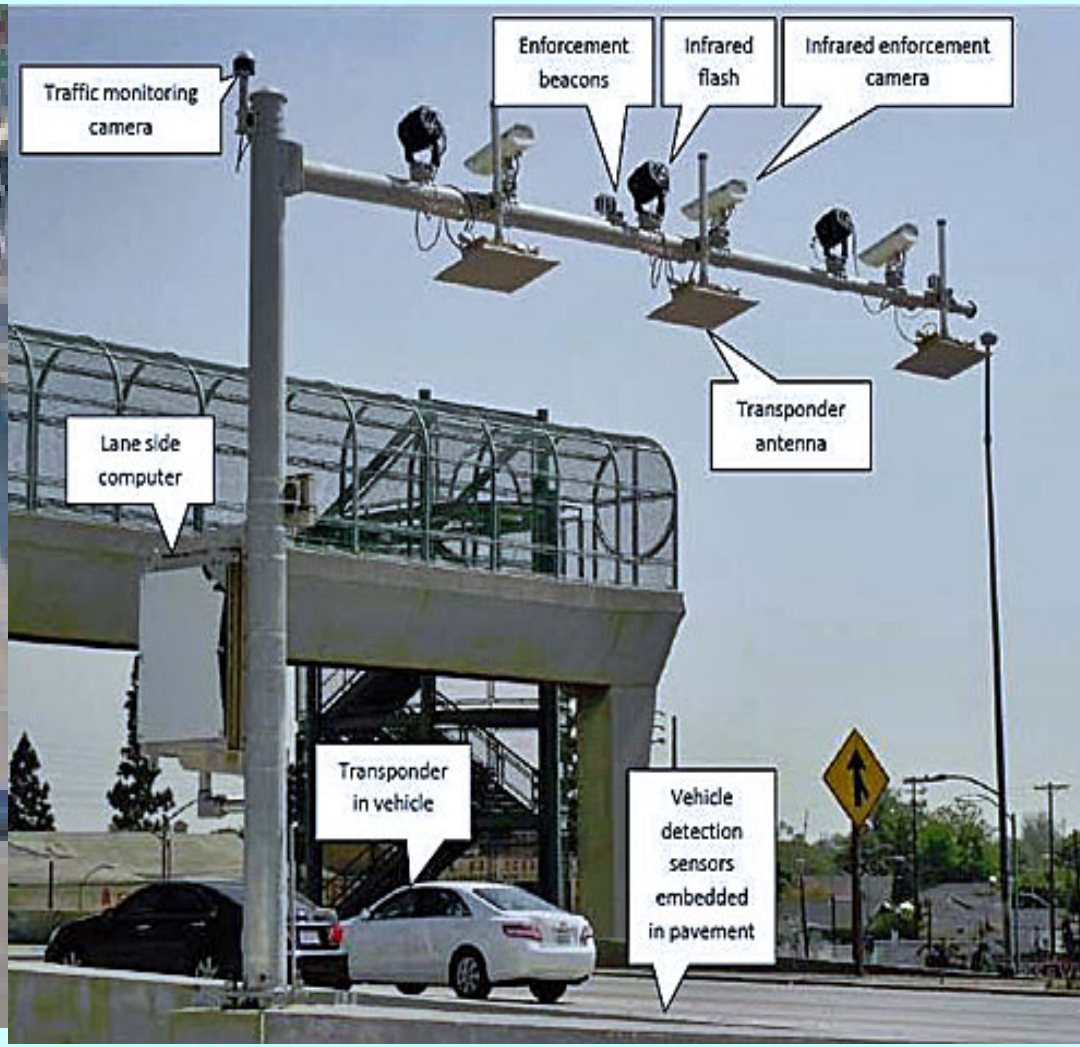
1990's – Traffic Management Centers

2000's – "Smart Bus" Systems



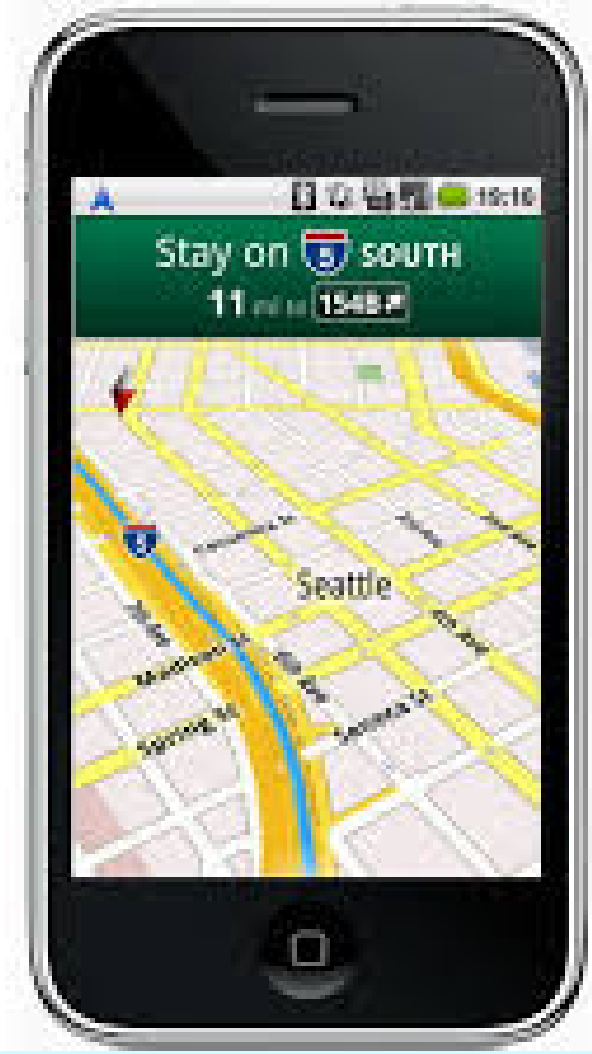
2000's – Traveler Information

2010's – Electronic Tolling & HOT Lanes

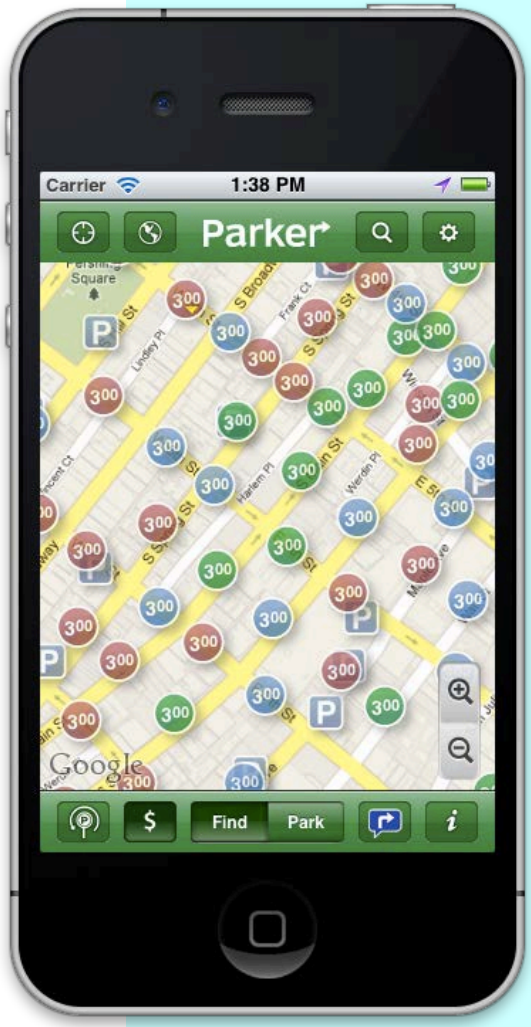


2010's – Mobile Devices

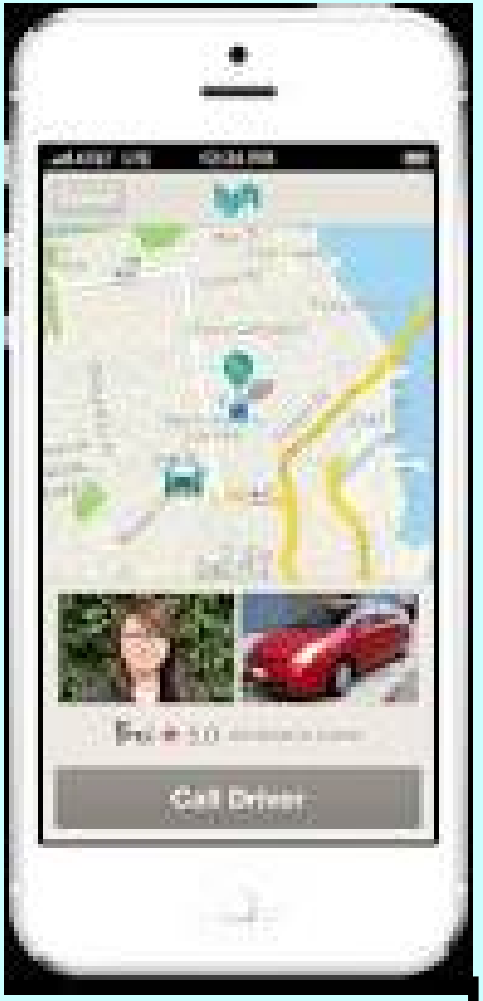
Traffic & Navigation



Parking Info & Guidance

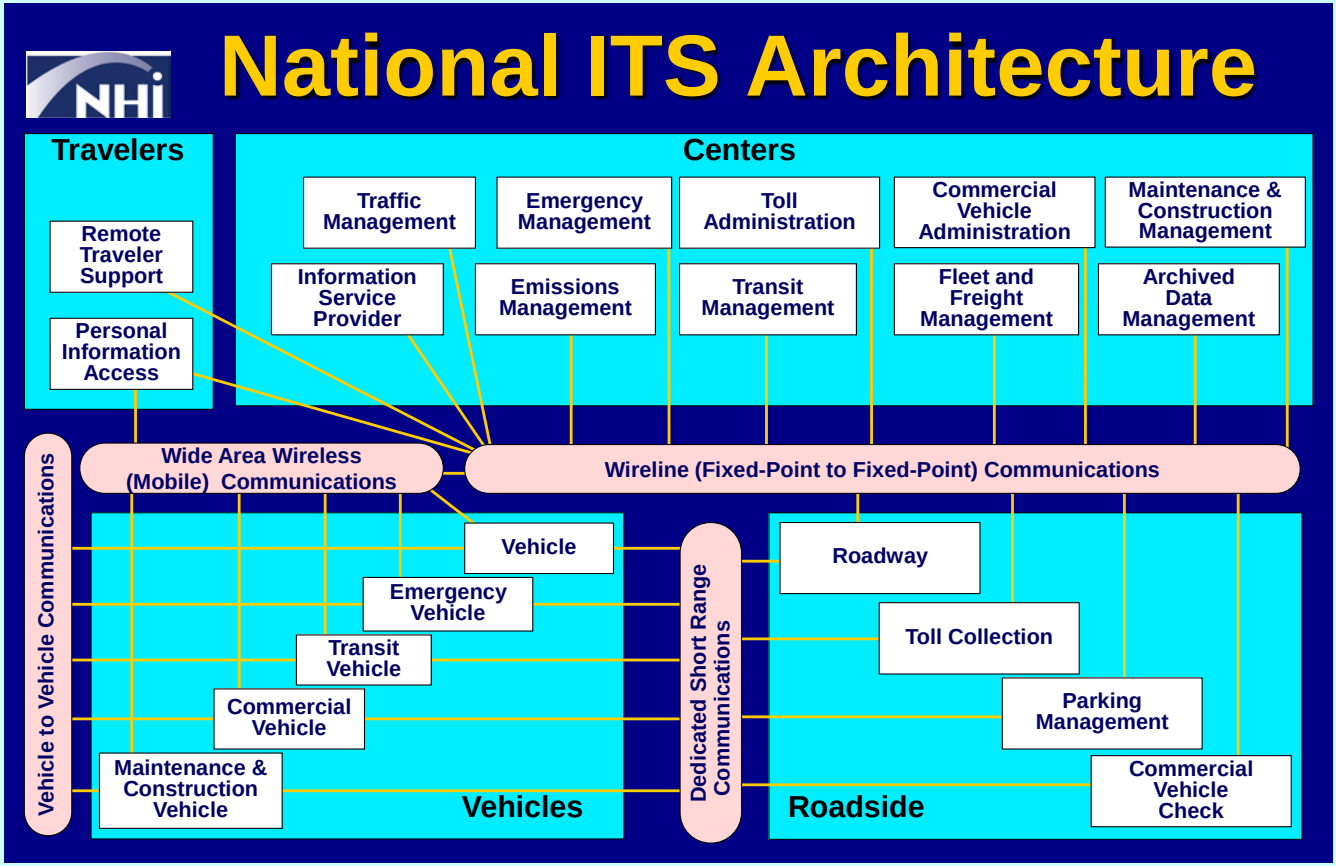


Ride-Hailing & Carpooling



Meanwhile, …
at the “institutional” level…

Mid-1990s:



- Created by USDOT
- Goal: Define a standard, national, interoperable, ITS framework
- Guideline for future transportation systems
- Built upon S.E. concepts & terminology

Late 1990's – ITS Arch. & SE "Rule"

- **Codified in: 23 CFR 940**
- **Defined ITS and ITS Projects (940.3)**
- **Required:**
  - **Regional ITS Architectures in all Urban Areas (940.9)**
  - **"Systems Engr. Analysis" for all ITS projects (940.11)**
- **Defined S.E. concepts and terminology; still widely used today.**
- **(Drew heavily on aerospace & I.T. concepts, terminology, and people.)**

High-Risk ITS Projects Must use S.E. Process

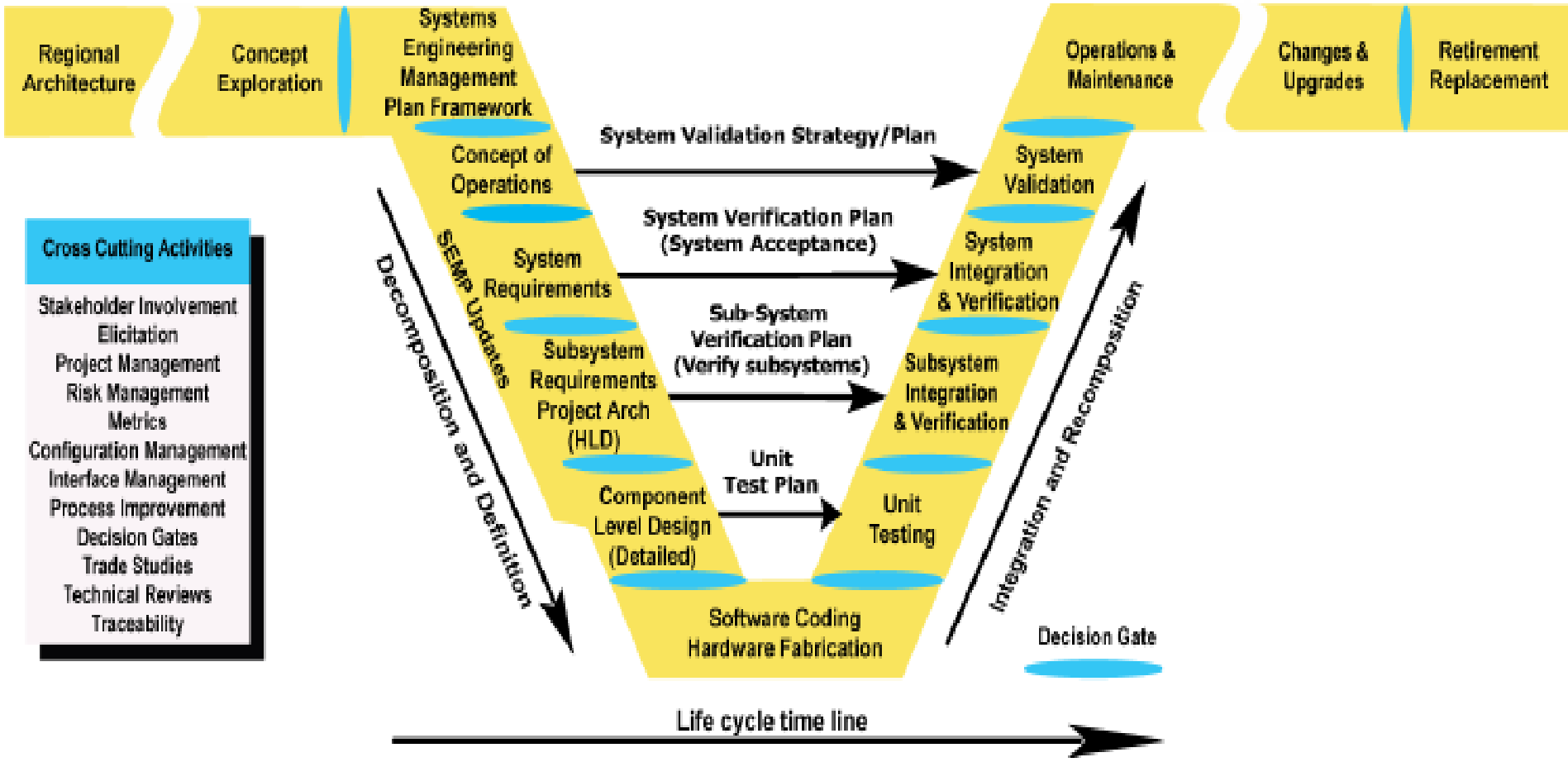


Figure 1-2 ITS Project Life cycle Phases and the Life cycle Tasks in this Guidebook

Jesse's Observations…

ITS Projects are increasingly complex:

- **Multi-agency, multi-modal, multi-purpose**
- **More people "in the control loop"**
- **Requirements much less foreseeable.**

Less hardware, more software:

- **SW development difficult to manage**
- **SW requires *a lot* of maintenance**
- **Ever-changing security threats**

→ *Need more flexible development tools!*

What's the Future of ITS?

Self-Driving ("Autonomous") Vehicles

(under private-sector leadership)

Vehicles will also be "Connected"
(USDOT leadership)

... connected to each other on *freeways*:

… and on surface streets ("V2V") …

… and connected to roadway (“V2I”)

… and to peds, bikes, etc. (V2X)

Vehicles must also ***cooperate***

Jesse's Prediction for "ITS in 2068"

<u>Automated, Connected, Cooperating, Electric Vehicles</u>

- ***No traffic congestion***
- ***No crashes***
- ***No air pollution/GHG***
- ***No driving stress***
- ***Mobility for all***

New USDOT Report …

Applying Scrum Methods to ITS Projects

www.its.dot.gov/index.htm
Final Report — August 2017
Publication Number: FHWA-JPO-17-508

https://rosap.ntl.bts.gov/view/dot/32681

Report Development Team

USDOT **– Kingsley Azubike, Ed Fok, Jesse Glazer**

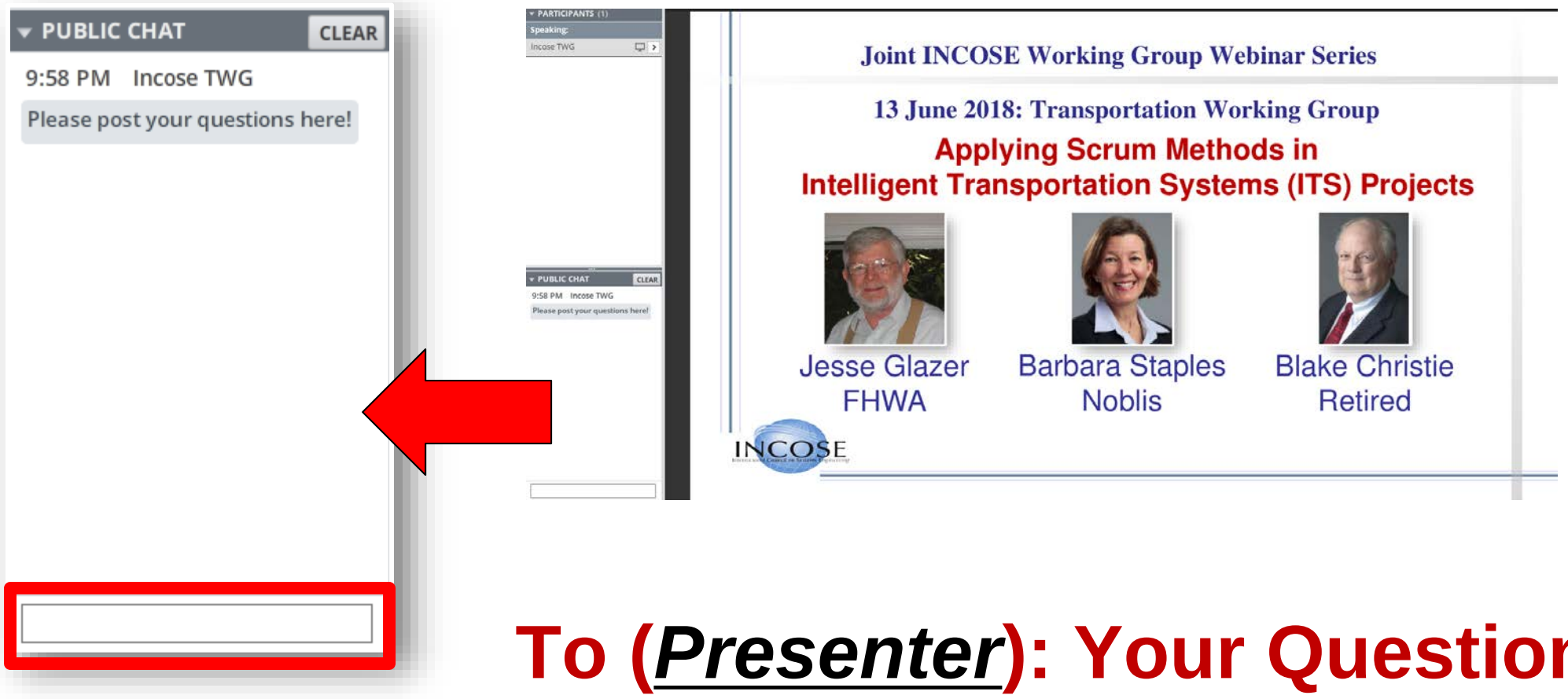
Noblis **– Barbara Staples, Blake Christie, Dawn Hardesty, Taylor Deurbrouck, Josh Seder**

ConSysTec **– Manny Insignares, Patrick Chan**

Also thanks to TWG for 2016 "Agile in ITS" webinar: Simon Smith, Phyllis Marbach, Jean Souza, Jennifer Russell.

Barbara Staples will describe the Report

Please post your questions under the “Public Chat” box



To (*Presenter*): Your Question

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Purpose of Presentation

- Introduce *Applying Scrum Methods to ITS Projects*
  - When and how to use Scrum methods in Systems Engineering
  - Why Important to you and deployers

FHWA Initiative

- **Why did FHWA develop the document?**
  - Constituents asking about using agile
- **Why important to you and deployers?**
  - Scrum being used and likely to continue
  - Combine Scrum with systems engineering within 23 CFR 940.11
  - Consistent application regarding 23 CFR 940.11
  - Share information with State/local transportation agencies

Covered in Executive Summary, Sections 1 and 9.2

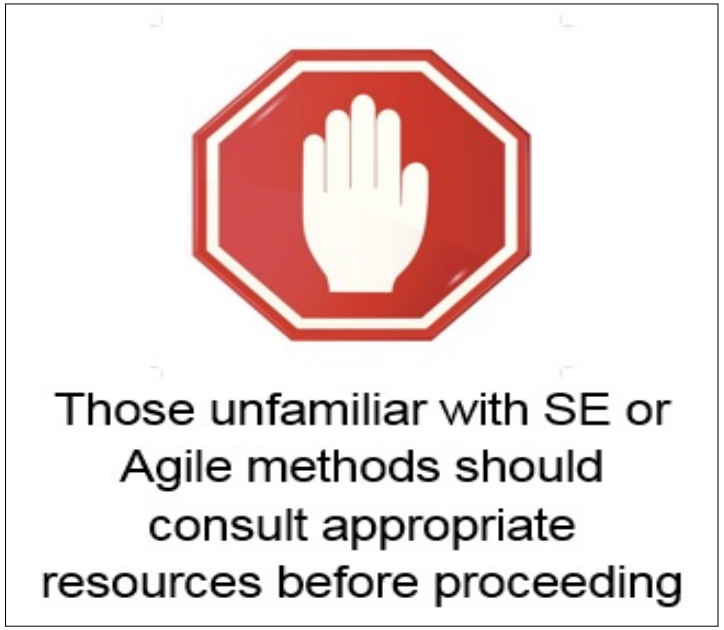
Compatibility with Federal Regulations

- Applying Scrum Methods within the Vee **is consistent with** FHWA SE guidebooks for ITS projects
  - Systems Engineering Guidebook for Intelligent Transportation Systems, Version 3.0
  - Systems Engineering for Intelligent Transportation Systems: An Introduction for Transportation Professionals
- The Vee Model (recommended by the guidebooks) with Agile development are compatible with 23 CFR 940.11 – when used properly
  - The Vee Model is compatible with 23 CFR 940.11
  - Agile (Scrum) is compatible with 23 CFR 940.11 when used within a proven Vee Model context

Covered in Sections 1.2 and 7

Intended Audience & Warning

- Two primary audiences
  - State and local transportation agencies
  - FHWA Division Office staff
- Decision-makers within these two groups
- Contractors/System integrators supporting State/local agencies



Source: Noblis 2017

Covered in Sections 1.1 and 3

Two Key Take-Aways

1. Can I use Scrum with traditional systems engineering?

Project suited to consider use of Agile (or Scrum) include:

- Client vision is incomplete and needs fleshing out
- Upgrade to existing systems is well understood
- New human interfaces
- Web sites
- Functionality that can be delivered incrementally

Source: ThinkStock

Project not suited to use Agile (or Scrum) include:

- Safety critical or safety of life features/functions
- Long-term maintenance and thoroughly documented project design decisions required legally
- Integration of disparate systems

Covered in Executive Summary and Section 3

Two Key Take-Aways (continued)

2. Several challenges need to be addressed by those seeking to use Agile methods (or Scrum)
    - Consider the skill set, staff knowledge, and resources required
    - Consider the contracting needs and agency's procurement regulations
    - Agile is new to ITS community; implementation still evolving

Source: ThinkStock

Covered in Executive Summary and Section 3

What are the *benefits* of combining SE and Scrum?

- Can provide a holistic and cost-effective approach
- SE provides set of requirements for the overall system and allows for flexibility within the Scrum method.
- SE brings the comprehensive documentation needed for safety critical and maintaining systems
- Requirements developed in SE portion improves communication between design/implementation and test teams

Source: ThinkStock

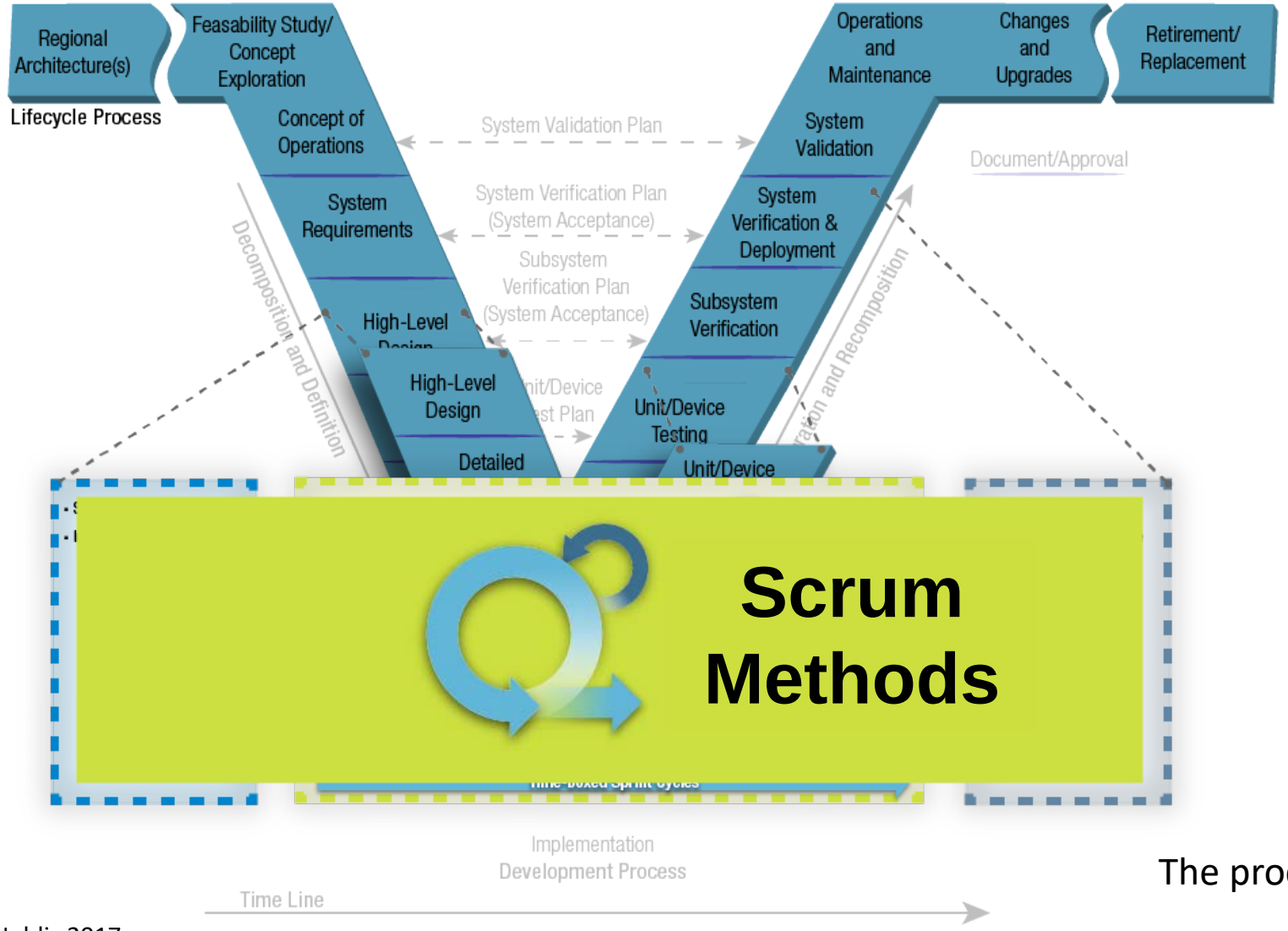
Covered in Sections 3.2, 4.1, and 5

New USDOT Paper on Applying Scrum within System Engineering

- What this document covers:
  - Using Scrum development as complement to SE
  - Introduces Scrum
  - Monitoring and Controlling quality when using Scrum
  - Common benefits, risks and lessons learned

Covered in Executive Summary and Section 1

Combining Scrum and Systems Engineering



The process in this figure is fully described in Section 4

Source: FHWA 2007 and modified by Noblis 2017

How to use this document

- State and Local Agency
  - Practitioners read Executive Summary and Sections 1, 2, 3, 4, 6 and 8
  - Decision makers read Executive Summary
- FHWA Division Staff
  - Staff read Executive Summary and Sections 1, 2, 3, 5, 6, 7, and 9
  - Decision makers read Executive Summary
- State or Local Agency Consultants/Contractors
  - Read the **ENTIRE** document

Covered in Section 1.3

Table of Contents

1	**Introduction**	Provides the purpose, scope, and background.
2	**Fundamentals of SE, Scrum Development, and the Vee Model**	Summarizes fundamentals of SE and the Vee Model; describes the Scrum methodology; and introduces the concept of combining each.
3	**Getting Started - Why and When to Use Agile**	Guides PMs through decision making process for when and where to use Agile (Scrum Method).
4	**How Agile (Scrum method) fits into the Vee Model** –	Explains how Scrum and the Vee model relate. Use this section to consider how to fit the Scrum method into the overall Vee Model.
5	**Cross-Cutting Activities**	Explains activities that will cut across all SE and Agile methods that should be considered to successfully manage system development.

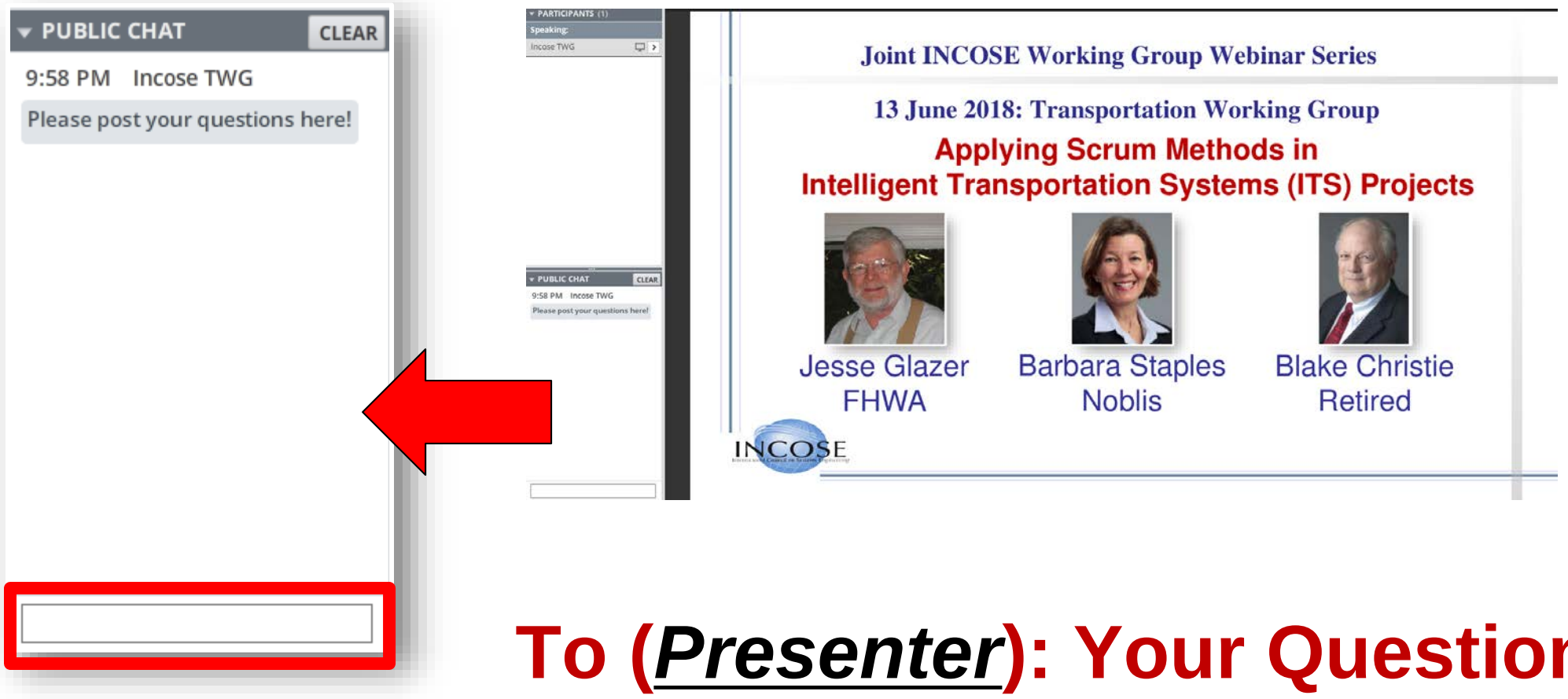
Covered in Section 1.3

Table of Contents (continued)

6	**Roles and Responsibilities when using the Scrum Method**	Explains the roles and responsibilities in a combined Scrum and Vee model project.
7	**Considerations for Federal Assistance When Using Agile**	Identifies when and how using Agile methods is not in conflict with the requirements of 23 CFR 940.11.
8	**Procurement Options/Contracting**	Provides information to help PMs develop procurement and contracting specifications for projects where Agile is a possible option.
9	**Summary and Next Steps**	Provides top 12 suggestions for using a combined approach, and provides potential next steps for improving this document.

Covered in Section 1.3

Please post your questions under the “Public Chat” box



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Q&A

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GlobalMeet Participant Features:

Mute / Un-mute *6

Increase volume *4

Decrease volume *7

Increase microphone *5

Decrease microphone *8

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